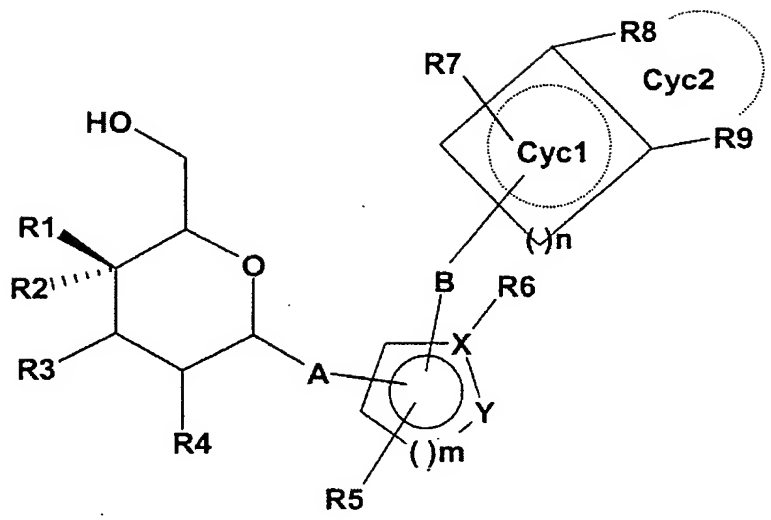
We claim:

1. A compound of formula I



I

wherein

R1 and R2 are each independently F or H or one of said radicals R1 and R2 may be OH;

R3 is OH or F, with the proviso that at least one of the radicals R1, R2 and R3 must be F;

R4 is OH;

A is O, NH, CH_2, S or a bond;

X is C, O, S or N, with the proviso that X is C when Y is O or S;

Y is N, O or S;

m is 1 or 2;

R5 is hydrogen, F, Cl, Br, I, OH, CF_3, NO_2, CN, COOH, $CO(C_1-C_6)$-alkyl, $COO(C_1-C_6)$-alkyl, $CONH_2$, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_6)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-$O-(C_1-C_6)$-alkyl, phenyl, benzyl, (C_1-C_6)-alkoxycarboxyl,

wherein said $CO(C_1-C_6)$-alkyl, $COO(C_1-C_6)$-alkyl, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_6)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-$O-(C_1-C_6)$-alkyl and (C_1-C_6)-alkoxycarboxyl radicals are optionally substituted with one or more fluorine atoms,

SO_2-NH_2, $SO_2NH(C_1-C_6)$-alkyl, $SO_2N[(C_1-C_6)\text{-alkyl}]_2$, $S-(C_1-C_6)$-alkyl, $S-(CH_2)_o$-phenyl, $SO-(C_1-C_6)$-alkyl, $SO-(CH_2)_o$-phenyl, $SO_2-(C_1-C_6)$-alkyl, $SO_2-(CH_2)_o$-phenyl,

wherein said $SO_2NH(C_1-C_6)$-alkyl, $SO_2N[(C_1-C_6)\text{-alkyl}]_2$, $S-(C_1-C_6)$-alkyl, $SO-(C_1-C_6)$-alkyl and $SO_2-(C_1-C_6)$-alkyl radicals are optionally substituted with one or more fluorine atoms, and wherein the phenyl ring of said $S-(CH_2)_o$-phenyl, $SO-(CH_2)_o$-phenyl and $SO_2-(CH_2)_o$-phenyl radicals is optionally mono- or disubstituted with F, Cl, Br, OH, CF_3, NO_2, CN, OCF_3, $O-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl or NH_2, and wherein o is 0, 1, 2, 3, 4, 5, or 6,

NH_2, $NH-(C_1-C_6)$-alkyl, $N((C_1-C_6)\text{-alkyl})_2$, $NH(C_1-C_7)$-acyl, phenyl or $O-(CH_2)_o$-phenyl,

wherein the phenyl ring of said phenyl and $O-(CH_2)_o$-phenyl radicals is optionally mono-, di-, or trisubstituted with F, Cl, Br, I, OH, CF_3, NO_2, CN, OCF_3, $O-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl, NH_2, $NH(C_1-C_6)$-alkyl, $N((C_1-C_6)\text{-alkyl})_2$, SO_2-CH_3, COOH, $COO-(C_1-C_6)$-alkyl or $CONH_2$, and wherein o is as hereinabove defined;

or, when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring;

R6 is H, (C_1-C_6)-alkyl, (C_1-C_6)-alkenyl, (C_3-C_6)-cycloalkyl, or phenyl wherein said phenyl radical is optionally substituted with halogen or (C_1-C_4)-alkyl;

B is (C_0-C_{15})-alkanediyl, wherein one or more of the carbon atoms in said alkanediyl radical may be replaced, independently of one another, with -O-, -(C=O)-, -CH=CH-, -C≡C-, -S-, -CH(OH)-, -CHF-, $-CF_2-$, -(S=O)-, $-(SO_2)-$, $-N((C_1-C_6)$-alkyl)-, $-N((C_1-C_6)$-alkyl-phenyl)- or -NH-;

n is 0, 1, 2, 3 or 4;

Cyc1 is a 3-, 4-, 5-, 6- or 7-membered saturated, partially saturated or unsaturated ring, wherein one carbon atom of said ring may be replaced by O, N or S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, CF_3, NO_2, CN, COOH, $COO(C_1-C_6)$-alkyl, $CO(C_1-C_4)$-alkyl, $CONH_2$, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_8)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-O-(C_1-C_6)-alkyl,

wherein said $COO(C_1-C_6)$-alkyl, $CO(C_1-C_4)$-alkyl, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_8)-alkoxy, $HO-(C_1-C_6)$-alkyl and (C_1-C_6)-alkyl-O-(C_1-C_6)-alkyl radicals are optionally substituted with one or more fluorine atoms,

SO_2-NH_2, $SO_2NH(C_1-C_6)$-alkyl, $SO_2N[(C_1-C_6)\text{-alkyl}]_2$, $S-(C_1-C_6)$-alkyl, $S-(CH_2)_o$-phenyl, SCF_3, $SO-(C_1-C_6)$-alkyl, $SO-(CH_2)_o$-phenyl, $SO_2-(C_1-C_6)$-alkyl, $SO_2-(CH_2)_o$-phenyl,

wherein said $SO_2NH(C_1-C_6)$-alkyl, $SO_2N[(C_1-C_6)\text{-alkyl}]_2$, $S-(C_1-C_6)$-alkyl, $SO-(C_1-C_6)$-alkyl and $SO_2-(C_1-C_6)$-alkyl radicals are optionally substituted with one or more fluorine atoms, and wherein the phenyl ring of said $S-(CH_2)_o$-phenyl, $SO-(CH_2)_o$-phenyl and $SO_2-(CH_2)_o$-phenyl radicals is optionally mono- or disubstituted with F, Cl, Br, OH, CF_3, NO_2, CN, OCF_3, $O-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl or NH_2, and wherein o is

as hereinabove defined,

NH_2, NH-$(C_1$-$C_6)$-alkyl, N$((C_1$-$C_6)$-alkyl$)_2$, NH$(C_1$-$C_7)$-acyl, phenyl or O-$(CH_2)_o$-phenyl,

wherein the phenyl ring of said phenyl and O-$(CH_2)_o$-phenyl radicals is optionally mono-, di-, or trisubstituted with F, Cl, Br, I, OH, CF_3, NO_2, CN, OCF_3, $(C_1$-$C_8)$-alkoxy, $(C_1$-$C_6)$-alkyl, NH_2, NH$(C_1$-$C_6)$-alkyl, N$((C_1$-$C_6)$-alkyl$)_2$, SO_2-CH_3, COOH, COO-$(C_1$-$C_6)$-alkyl or $CONH_2$, and wherein o is as hereinabove defined;

or R8 and R9 taken together with the carbon atoms to which they are attached form a 5-, 6- or 7- membered, saturated, partially saturated or completely unsaturated ring herein referred to as Cyc2,

wherein one or two carbon atom(s) in said Cyc2 ring are optionally replaced by N, O or S, and wherein said Cyc2 ring is optionally substituted with $(C_1$-$C_6)$-alkyl, $(C_2$-$C_5)$-alkenyl or $(C_2$-$C_5)$-alkynyl,

wherein said $(C_1$-$C_6)$-alkyl, $(C_2$-$C_5)$-alkenyl and $(C_2$-$C_5)$-alkynyl radicals are optionally substituted with F, Cl, OH, CF_3, NO_2, CN, COO$(C_1$-$C_4)$-alkyl, $CONH_2$, CONH$(C_1$-$C_4)$-alkyl or OCF_3,

and wherein a $-CH_2-$ group contained in said $(C_1$-$C_6)$-alkyl, $(C_2$-$C_5)$-alkenyl and $(C_2$-$C_5)$-alkynyl radicals is optionally replaced by –O-;

and pharmaceutically acceptable salts thereof.

2. The compound of Claim 1 wherein:

R1 and R2 are each independently F or H or one of said radicals R1 and R2 may be OH,
with the proviso that at least one of said radicals R1 and R2 is F;

R3 is OH;

R4 is OH;

A is O or NH;

X is C, O or N, with the proviso that X is C when Y is S;

Y is N or S;

m is 1 or 2;

R5 is hydrogen, F, Cl, Br, I, OH, CF_3, NO_2, CN, COOH, $CO(C_1-C_6)$-alkyl, $COO(C_1-C_6)$-alkyl, $CONH_2$, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_6)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-$O-(C_1-C_6)$-alkyl, phenyl, benzyl or (C1-C6)-alkoxycarboxyl,

wherein said $CO(C_1-C_6)$-alkyl, $COO(C_1-C_6)$-alkyl, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_6)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-$O-(C_1-C_6)$-alkyl, (C1-C6)-alkoxycarboxyl and $SO-(C_1-C_6)$-alkyl radicals are optionally substituted with one or more fluorine atoms,

or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring;

R6 is H, (C_1-C_6)-alkyl, (C_1-C_6)-alkenyl, (C_3-C_6)-cycloalkyl, or phenyl wherein said phenyl radical is optionally substituted with halogen or (C_1-C_4)-alkyl;

B is (C_0-C_{15})-alkanediyl, wherein one or more of the carbon atoms in said alkanediyl radical may be replaced, independently of one another, with -O-, -(C=O)-, -CH=CH-, -C≡C-, -S-, -CH(OH)-, -CHF-, $-CF_2-$, -(S=O)-, $-(SO_2)-$, $-N((C_1-C_6)\text{-alkyl})-$, $-N((C_1-C_6)\text{-alkyl-phenyl})-$ or -NH-;

n is 0, 1, 2, 3 or 4;

Cyc1 is a 3-, 4-, 5-, 6- or 7-membered saturated, partially saturated or unsaturated ring, wherein one carbon atom of said ring may be replaced by O or S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, CF_3, NO_2, CN, COOH, $COO(C_1-C_6)$-alkyl, $CO(C_1-C_4)$-alkyl, $CONH_2$, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_8)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-O-(C_1-C_6)-alkyl, $S-(C_1-C_6)$-alkyl, CF3 or $SO-(C_1-C_6)$-alkyl,

wherein said $COO(C_1-C_6)$-alkyl, $CO(C_1-C_4)$-alkyl, $CONH(C_1-C_6)$-alkyl, $CON[(C_1-C_6)\text{-alkyl}]_2$, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_2-C_6)-alkynyl, (C_1-C_8)-alkoxy, $HO-(C_1-C_6)$-alkyl, (C_1-C_6)-alkyl-O-(C_1-C_6)-alkyl, $S-(C_1-C_6)$-alkyl and $SO-(C_1-C_6)$-alkyl radicals are optionally substituted with one or more fluorine atoms,

or R8 and R9 taken together with the carbon atoms to which they are attached form a 5-, 6- or 7- membered, saturated, partially saturated or completely unsaturated ring herein referred to as Cyc2,

wherein one or two carbon atom(s) in said Cyc2 ring is optionally replaced by N, O or S, and wherein said Cyc2 ring is optionally substituted with (C_1-C_6)-alkyl, (C_2-C_5)-alkenyl or (C_2-C_5)-alkynyl,

wherein said (C_1-C_6)-alkyl, (C_2-C_5)-alkenyl and (C_2-C_5)-alkynyl radicals are optionally substituted with F, Cl, OH, CF_3, NO_2, CN, $COO(C_1-C_4)$-alkyl, $CONH_2$, $CONH(C_1-C_4)$-alkyl or OCF_3,

and wherein a –CH2- group contained in said (C_1-C_6)-alkyl, (C_2-C_5)-alkenyl and (C_2-C_5)-alkynyl radicals is optionally replaced by –O-.

3. The compound of Claim 1 wherein the sugar residues are beta(β)-linked and the stereochemistry in the 2, 3 and 5 position of the sugar residue has the D-gluco configuration.

4. The compound of Claim 1 wherein:

R1 and R2 are each independently F or H or one of said radicals R1 and

R2 may be OH,
with the proviso that at least one of said radicals R1 and R2 is F;

R3 is OH;

R4 is OH;

A is O;

X is C, O or N, with the proviso that X is C when Y is S;

Y is N or S;

m is 1;

R5 is hydrogen, F, Cl, CF_3, OCF_3, $COO(C_1-C_4)$-alkyl, (C_1-C_5)-alkyl, (C_2-C_4)-alkenyl, (C_2-C_4)-alkynyl, (C_1-C_4)-alkoxy, HO-(C_1-C_4)-alkyl, (C_1-C_4)-alkyl-O-(C_1-C_4)-alkyl, phenyl, benzyl, (C_1-C_4)-alkoxycarboxyl, OCH_2CF_3 or (C_1-C_4)-alkyl-CF_2-,

or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring;

R6 is H, (C_1-C_6)-alkyl, (C_1-C_6)-alkenyl, (C_3-C_6)-cycloalkyl, or phenyl wherein said phenyl radical is optionally substituted with halogen or (C_1-C_4)-alkyl;

B is (C_1-C_4)-alkanediyl, wherein one carbon atom in said alkanediyl radical may be replaced with -O-, -(C=O)-, -CH(OH)-, -CHF-, $-CF_2$-, -CO-NH-;

n is 2 or 3;

Cyc1 is an unsaturated 5- or 6-membered ring, wherein one carbon atom of said ring may be replaced by O or S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, (C_1-C_4)-alkyl, OCH_2CF_3, (C_1-C_8)-alkoxy, HO-(C_1-C_6)-alkyl, (C_1-C_4)-

alkyl-O-(C_1-C_4)-alkyl, S-(C_1-C_4)-alkyl, SCF_3 or OCF_3,

or R8 and R9 taken together form the radicals –C=CH-O-, -CH=CH-S- or –CH=CH-CH=CH- and, with the carbon atoms to which they are attached, form an unsaturated or partially saturated 5- or 6-membered ring, said ring being optionally substituted by (C_1-C_4)-alkoxy or –O-$(CH_2)_p$-O- wherein p is 1 or 2.

5. The compound of Claim 1 wherein:

R1 and R2 are each independently F or H,
with the proviso that at least one of said radicals R1 and R2 is F;

R3 is OH;

R4 is OH;

A is O;

X is C and Y is S, or
is O and Y is N, or
is N and Y is N;

m is 1;

R5 is hydrogen, CF_3, (C_1-C_6)-alkyl, or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring,

R6 is H, (C_1-C_4)-alkyl or phenyl;

B is –CH_2-, -C2H_4-, -C_3H_6-, -CO-NH-CH_2- or –CO-CH_2-CH_2-;

n is 2 or 3;

Cyc1 is an unsaturated 5- or 6-membered ring, wherein one carbon atom of said ring may be replaced by S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, (C_1-C_6)-alkyl, (C_1-C_4)-alkoxy, S-(C_1-C_4)-alkyl, SCF3 or OCF3,

or R8 and R9 taken together form the radicals –C=CH-O- or –CH=CH-CH=CH- and, with the carbon atoms to which they are attached, form an unsaturated or partially saturated 5- or 6-membered ring, said ring being optionally substituted by (C1-C4)-alkoxy.

6. The compound of Claim 1 wherein:

R1 and R2 are each independently F or H, with the proviso that at least one of said radicals R1 and R2 is F;

R3 is OH;

R4 is OH;

A is O;

X is C and Y is S, or is N and Y is N;

m is 1;

R5 is hydrogen, CF_3, (C_1-C_6)-alkyl, or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring,

R6 is H or (C_1-C_4)-alkyl;

B is $–CH_2$- or -CO-NH-CH_2-;

n is 2 or 3;

Cyc1 is phenyl or thiophene;

R7, R8, and R9 are each independently hydrogen or Cl,

or R8 and R9 taken together with the carbon atoms to which they are attached, form a furan ring or a phenyl ring optionally substituted with methoxy.

7. A pharmaceutical composition comprising a compound of Claim 1 and a pharmaceutically acceptable carrier.

8. A pharmaceutical composition comprising a compound of Claim 1 and one or more blood glucose-lowering active ingredients.

9. A method of treating type 1or type 2 diabetes which comprises administering to a patient in need thereof a therapeutically effective amount of a compound of Claim 1.

10. A method of lowering blood glucose which comprises administering to a patient in need thereof a therapeutically effective amount of a compound of Claim 1.

11. A method of treating type 1or type 2 diabetes which comprises administering to a patient in need thereof a therapeutically effective amount of a compound of Claim 1 with at least one other blood glucose-lowering active ingredient.

12. A method of lowering blood glucose which comprises administering to a patient in need thereof a therapeutically effective amount of a compound of Claim 1 with at least one other blood glucose-lowering active ingredient.